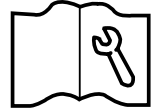


TSplus Vertical Transfer Module



Model VT2

Installation and Maintenance

Publication Number: 8981 500 315 6/05

Vertical Transfer Unit



BOSCH
Automation

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IMPORTANT SAFETY INFORMATION

IMPORTANT: This operation and installation manual should be reviewed with all equipment operators as part of your operator training program.

SAFETY FIRST!

Important safety information is contained throughout this manual to alert you to potentially dangerous situations and help prevent accidental injury and property damage.



The safety warning symbol above has been included to warn you of hazards that can hurt or kill you and others, and/or cause serious damage to the equipment and other property.

In addition, the following safety alert words are used:

DANGER! Means that you or others will be seriously or fatally injured if instructions are not followed.

WARNING! Means that you or others may be seriously or fatally injured if instructions are not followed.

CAUTION! Means that you or others may be injured if instructions are not followed.

Material Hazards:

Some components, such as gearboxes, contain lubricants or other materials that can represent a potential health hazard if handled, stored, or disposed of improperly.

Please contact Bosch for copies of the Material Safety Data Sheets (MSDS) for the lubricating oil used in gearboxes and other potentially hazardous materials.


Review All Safety Information:



Please review the safety information included on page 4 and throughout this manual with all installers, operators, and maintenance personnel of this equipment.

IMPORTANT SAFETY INFORMATION

WARNING!

Please read all assembly, and maintenance instructions carefully before beginning set-up of the components in this document.

Where appropriate, warning symbols  have been included in this publication to alert you of potential or impending danger.

- Be sure to read and observe all safety warnings in this document as well as those attached to the individual modules. Failure to do so could result in potential risks to your health and safety as well as those around you.
- Covers and guards have been designed to eliminate pinch points and exposure to moving belts and gears. **DO NOT** operate the conveyor or any of the other components in the system with the guards removed. Serious injury may result!
- All set-up maintenance and repair work should be performed only by properly trained, qualified personnel. All operators must be properly trained in the use of this equipment.
- A qualified electrician must make all electrical connections when wiring the components installed in the *TSplus* system. Be sure to follow all local, state and federal regulations when installing electrical devices of any type. The customer assumes responsibility for the control system, and must provide an EMERGENCY-OFF SWITCH or switches for all workstation operators to meet all applicable industry and OSHA requirements. In general, emergency-off switches must be present at easily accessible locations for all operators of the installed *TSplus* conveyor system.
- All power supplies must be LOCKED OUT before beginning maintenance or repair work of any type on the conveyor system. Proper LOCK OUT procedures include the identification of the locked out power supply with a tag to prevent the accidental restoration of power.
- *TSplus* pneumatic components are designed to operate in a range of 4–8 Bar (58–116 psi). It is the users responsibility to install a filtered, regulated air supply to limit the pressure to that recommended by the manufacturer. Before beginning any maintenance or repair, bleed off the pressure lines to position the BS2 in low level position to prevent unexpected or accidental movement of a system component which could result in personal injury.
- *TSplus* drives, returns and conveyor sections and components are designed to transport Bosch WT2/S, WT2/A, WT2/A-H workpiece pallets. Proper usage is defined as the transport and positioning of parts and assemblies via the workpiece pallet and fixture during the assembly process. In no instances should the pallet payload, the downward force applied to the pallet, or the total load carrying capacity of the entire system be exceeded. Exceeding published specifications will result in premature wear or system failure and may cause damage to the motor, gearbox, roller chain, seals and other components.
-  **CAUTION!** Do not operate or work near mechanical equipment when wearing loose clothing. Moving components such as roller chain, drive belts, drive shafts and pallets can snag long belts, scarves, ties and other loose fitting garments, and pull the worker into the equipment causing serious, or in extreme cases, life threatening injury.
-  **CAUTION!** Operators having long hair must wear appropriate head protection (hair nets, hats, and hair caps) to minimize the risk associated with working near moving machinery. Hanging hair can get caught in moving components such as roller chain, drive belts, drive shafts and pallets, and pull the worker into the equipment causing serious, or in extreme cases, life threatening injury.

SAVE THESE INSTRUCTIONS!

Introduction

Like all Bosch flexible assembly systems, *TSplus* is constructed solely from standardized modules that are precisely matched to each other. One important benefit of this modular design is that you can interlink manual and automatic work stations freely, making *TSplus* suitable for virtually any assembly task. The VT2 Vertical Transfer Unit (LTU) allows you to transfer vertically off of the main conveyor to a upper or lower return line.

About this manual

The manual is divided into the following sections to make it easier to use:

- **Design and Detailed Description** – Supplies an overview of the modules that make up the VT2. This section will familiarize you with the modules individual components.
- **Application and Function** – Gives general information about the VT2 Vertical Transfer Unit.
- **Technical Data** – Provides the most important technical specifications.
- **Assembly** – Lists step-by-step instruction for installing the VT2.
- **Initial Start-up** – Describes the final procedures for getting the VT2 up and running.
- **Maintenance** – Provides information on preventive maintenance.
- **Repair** – Gives step-by-step procedures for replacing any parts subjected to wear.

This manual describes the primary components that make up the VT2 Vertical Transfer Unit (refer to page 6 for a description of primary components and their functions).

Other *TSplus* modules are also available and vary according to the configuration of the system. These modules are described in separate manuals and include the following:

- Drives, Returns, and Conveyor Sections
- Cushioned and Standard Stop Gates, Rockers
- Proximity Switch Mounting Kits
- Accumulation Control Kits
- Lift-Position Units
- Lift-Rotate Units
- Curve Modules

Contact Bosch for information on these and any other modules for flexible assembly.

If this module was ordered as CE compliant, please contact our applications engineering department for a copy of the latest manufacturer's CE declaration, if required for your records.

Application and Function

The Vertical Pallet Transfer Unit shown in Fig. 1 is compatible with the *TSplus* conveyor systems. Its pneumatic, two position operation is designed to transfer workpiece pallets between transport levels. The internal conveyor of the VT2 has a reversing capability that allows workpiece pallets to enter and exit the unit from either end. This feature makes it possible to use the VT2 in any of the following configurations:

- As a “pass-through” system where the direction of travel remains the same and only the transport level changes.
- As a “reversing” system where workpiece pallets enter and exit the VT2.
- As a combination system that utilizes both the “pass-through” and “reversing” configurations.

The VT2 lets you transfer more than one workpiece pallet at a time. The maximum number transferred is determined by the following factors:

- Workpiece pallet length.
- Total workpiece pallet load.
- System configuration.
- Desired system cycle time.

The Transverse Conveyor, BS2/M, transfers the workpiece pallets within the VT2. The transverse conveyor receives workpiece pallets from a conveyor section at one level and transfers them back to another conveyor section at a different level.

Three (3) stops are available depending on payload carry capacity. It stops counter movement of the workpiece pallet after it has been loaded onto the transverse conveyor. The transverse conveyor’s vertical movement within the VT2 is accomplished by means of a carriage driven by a rodless cylinder coupled to a linear rail.

Technical Data

Technical data for the Vertical Transfer Unit is shown in Table 1.

It is available in two basic configurations, size I and size II.

Size I Over–Standard to overhead return
Under–Standard to underline return.

Size II Over–Standard to overhead return
Under–Standard to underline return.

Workpiece Pallet Size

Available widths, 160 mm to 800 mm.

Transverse Conveyor parameters:

Total permissible belt load*: 100 kg forward and reverse

Motor 480 VAC 60 Hz 3 phase standard. (Other voltages available upon request.)

Belt Speed 9 meters/min standard. (Other speeds available upon request.)

Pneumatic Cylinder:

Stroke to 750 mm V=850

Bore 80 mm O=2000

Limit Switches LED reed switches, type SLR-M05

Pneumatic Connections Pushlock-type connectors for:
 Pilot 5/32" (4 mm)
 Check Valve 3/8"

Operating Pressure 58-116 psi (4-8 bar)

Proximity Switches (Customer supplied)

3-Proximity Switch Brackets 2-Vertical Transfer (Provide for 12 mm dia)
 1-BS2M (Customer supplied proximity switch.)

NOTE: Determination of total permissible belt load is based on the use of standard **Bosch** pallets. Any change in pallets and pallet material which changes **the coefficient of friction** to the belt may reduce maximum load and increase wear.

Table 1: Technical Data

Description of Construction and Components

Design and Detailed Description

1. Transverse Conveyor
2. Stop Gate
3. Proximity Switch Holders
4. Rodless air Cylinder with Mounts
5. Carriage Plate Lockout
6. Bearing Rail
7. Bearing Blocks
8. Shock Absorbers
9. Cable Carrier
10. Frame constructed from extruded aluminum profile.
11. Tunnel Guarding

CAUTION! Guard and mounting fixture have been removed in various photos and illustrations to facilitate viewing of specific procedures. However, the unit should never be operated with guards and mounting fixtures removed!

A transverse conveyor in the Vertical Transfer functions in the horizontal plane to move workpiece pallets into and out of the VT2. Workpiece pallets entering the unit are stopped by a stop gate. Proximity switches then sense the pallets presence and initiate activation of the VT2, subsequently raising or lowering the transverse conveyor, depending on the operation sequence. Mounting brackets have been provided for a safety interlock switch to ensure that the access door remains closed during operation. To ensure safe operation of the VT2, user control logic must halt all movement upon cycle stop.

IMPORTANT! User-provided programmable logic controller or equivalent control logic must incorporate proper functioning of the safety-door interlock! The user assumes all responsibility for safe operation of the VT2 .

Vertical movement in the VT2 is provided by a pneumatic rodless cylinder, which raises and lowers the transverse conveyor by means of the carriage plate. The carriage plate is also connected to a supporting rail by four bearing blocks, which travel along the rail. Upper and lower shock absorbers serve to cushion the stroke, and the cable carrier protects any non-stationary plumbing and electrical cabling during operation.

Air is supplied through the cylinder proximity lockout valve, and upper and lower proximity switches (customer supplied) sense whether the stroke has reached its upper and lower limits, ensuring that transverse conveyor belt movement resumes at the desired transport level.

The unit is housed in a frame made of extruded aluminum profile. Guards are made of polycarbonate panels.

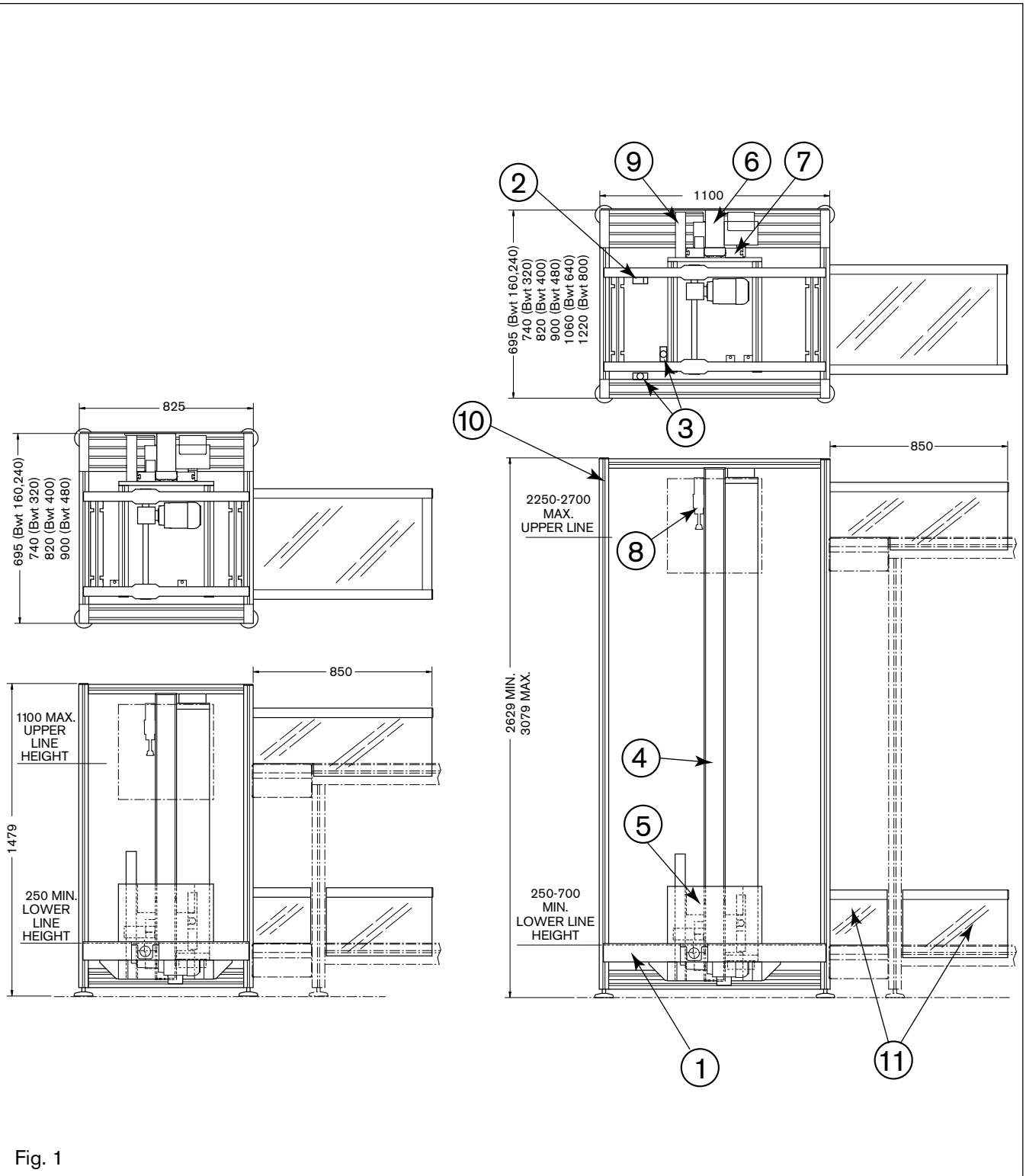


Fig. 1

Cycle Times

Approximate cycle times for the lifting and lowering of the VT2 pneumatic cylinder can be taken from Table 1, 2, 3, and 4. The complete cycle time of the VT2 will vary, however, depending on each application of the unit.

For a reversing type VT2, for example, one complete cycle consists of:

- 1) Loading the workpiece pallet(s),
- 2) Lowering the transverse conveyor,
- 3) Unloading the pallet(s), and
- 4) Raising the transverse conveyor to accept the next load.

Other related variables include conveyor and transverse conveyor transport speed; the distances involved in transporting the pallet (or pallets) to the end of the conveyor and then inside the VT2; and the VT2 transfer time from end position to end position. Due to variation in

these factors and others specific to each installation (such as the amount of end position cushioning desired or pallet availability at the prestop), the cycle time is best determined via actual timed cycle testing after VT2 installation.

Bar to PSI	PSI to Bar
4 bar = 58 psi	60 psi = 4.1 bar
5 bar = 72.5 psi	70 psi = 4.8 bar
6 bar = 87 psi	80 psi = 5.5 bar
7 bar = 101.5 psi	90 psi = 6.2 bar
8 bar = 116 psi	100 psi = 6.9 bar
	110 psi = 7.6 bar
	120 psi = 8.3 bar

Fig. 2 Bar to PSI conversion Chart

VT2/U Cycle Time
(Stroke = 850mm)

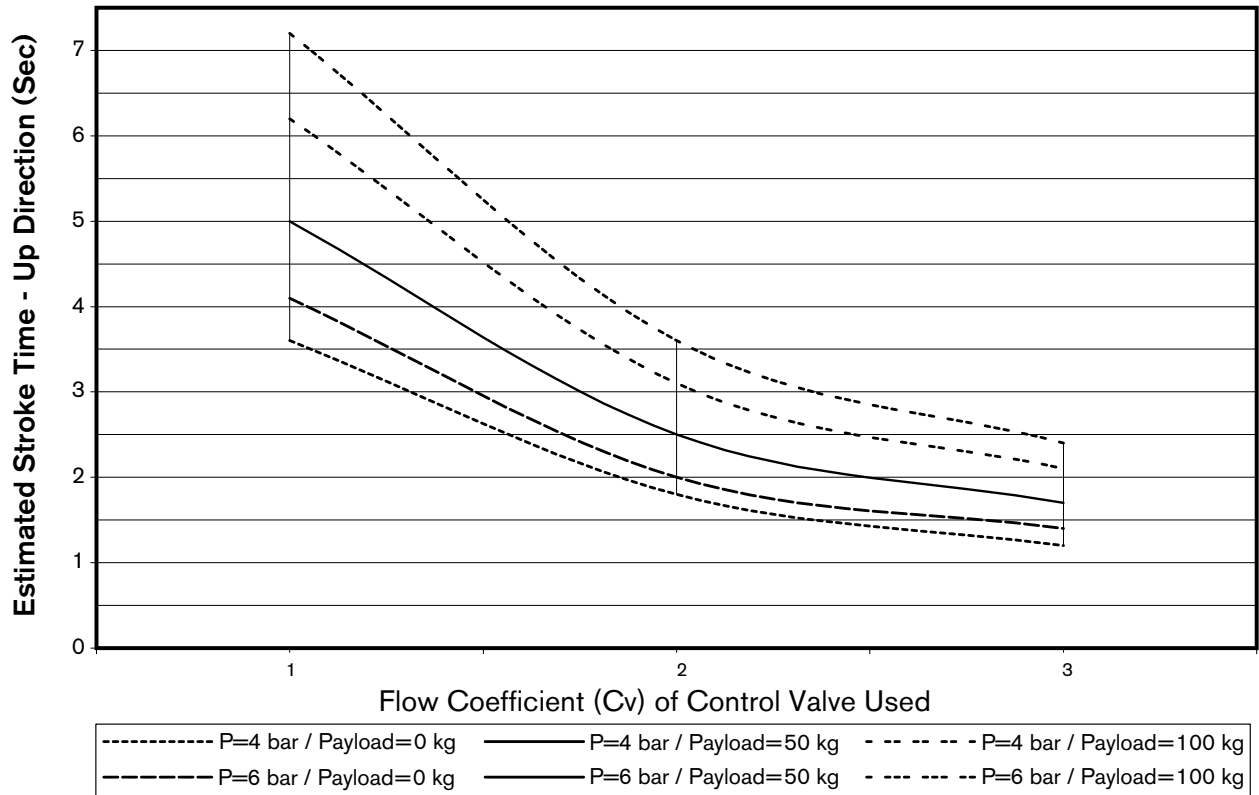


Table 1

VT2/U Cycle Time
(Stroke = 850mm)

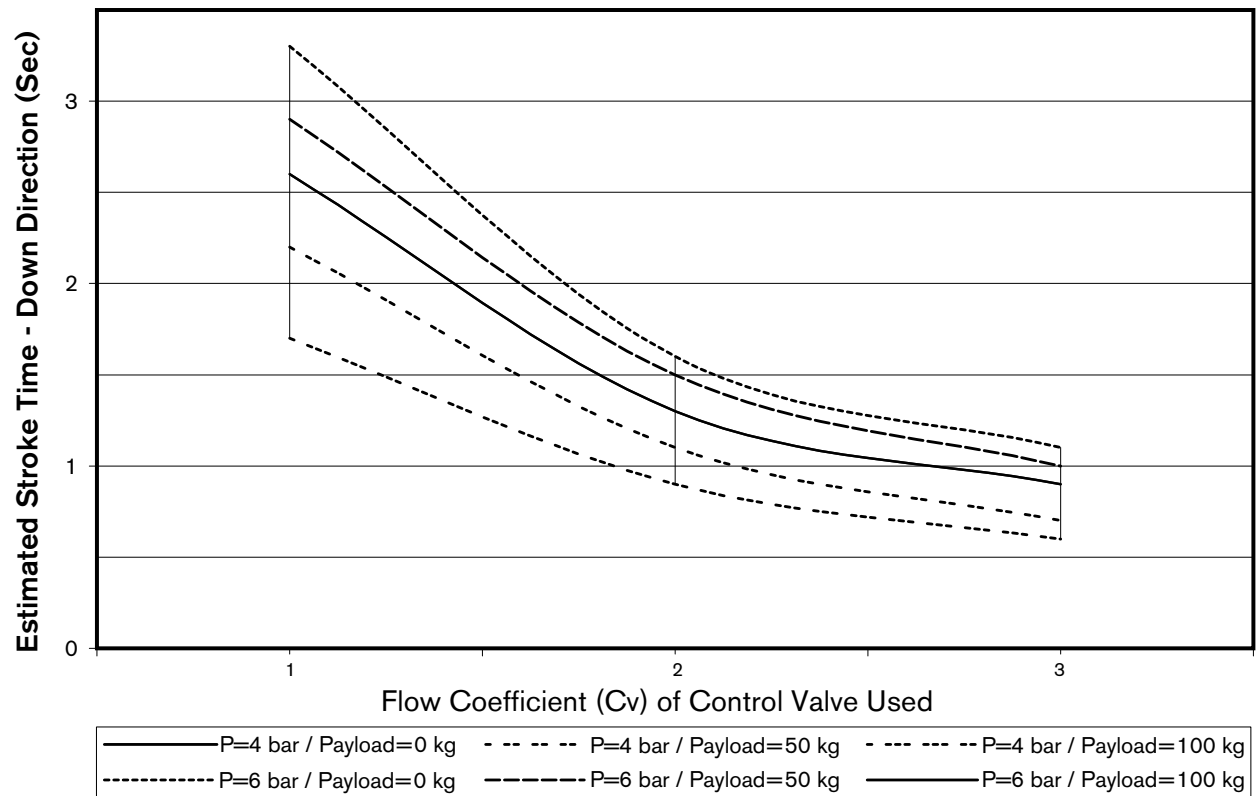


Table 2



VT2/O Cycle Time
(Stroke = 2000mm)

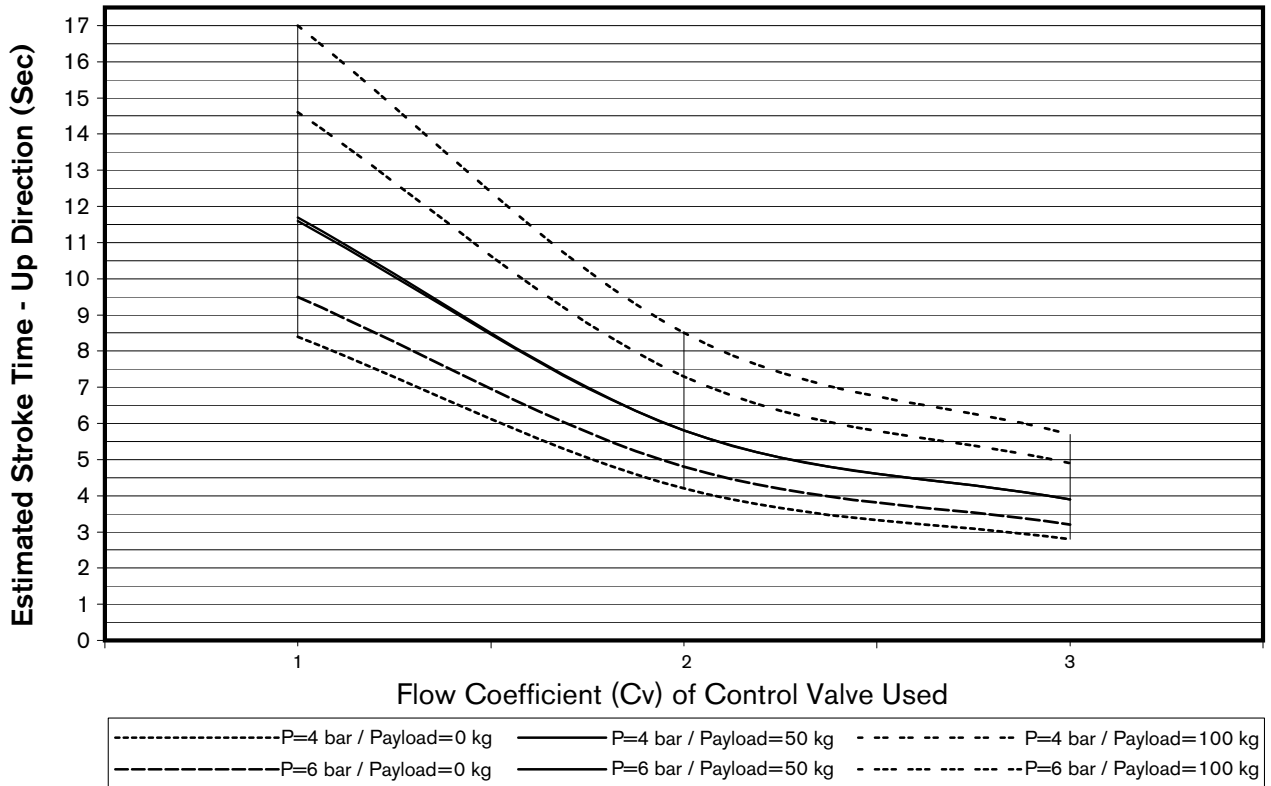


Table 3

VT2/O Cycle Time
(Stroke = 2000mm)

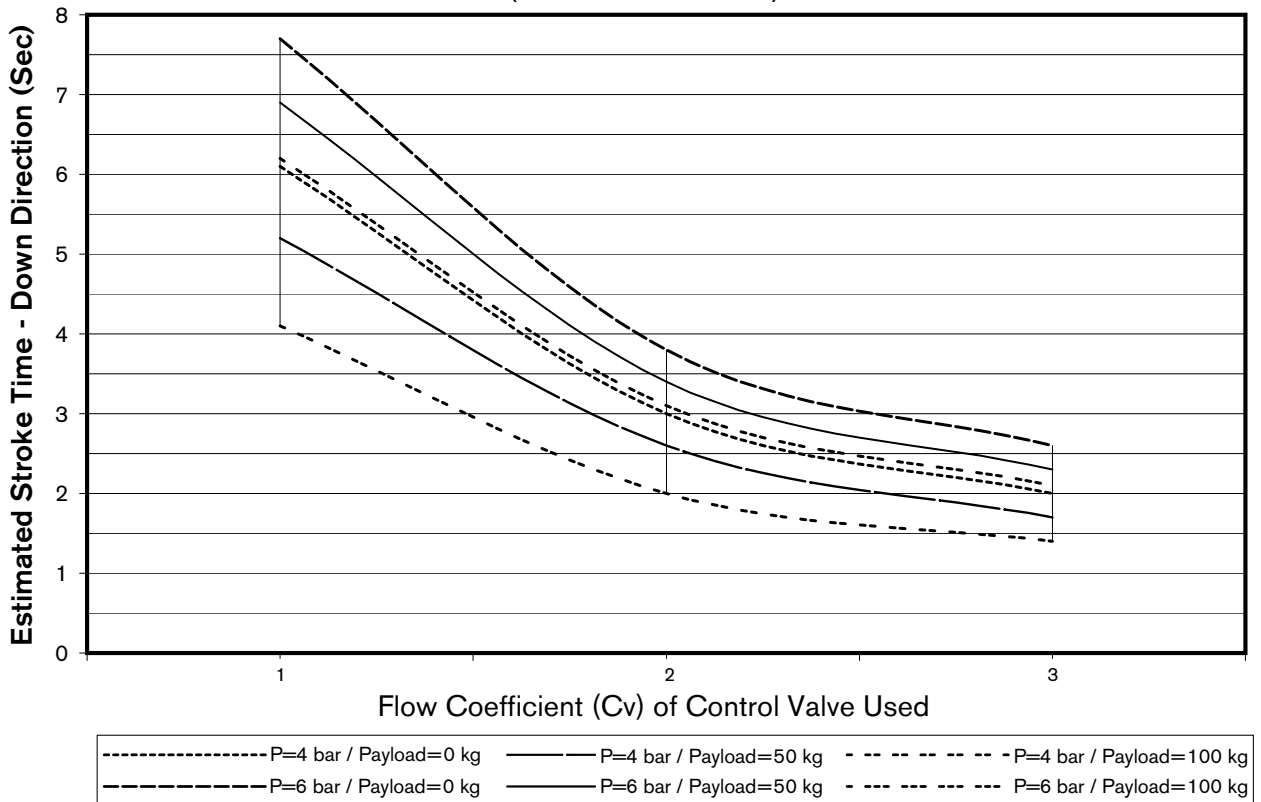


Table 4

Assembly

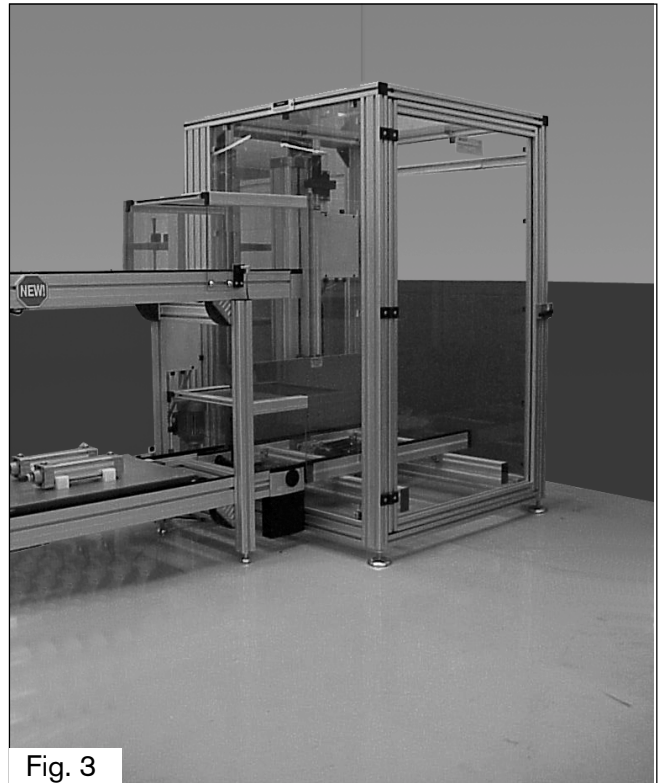
Positioning the VT2

The Vertical Transfer Unit comes pre-assembled and ready to be aligned with the conveyor (Fig. 3).

NOTE: The top, back and door panels are installed. The end panels however, are not installed and need to be cut and drilled for workpiece pallet passage. A tunnel leading to the pallet passage also needs to be assembled.

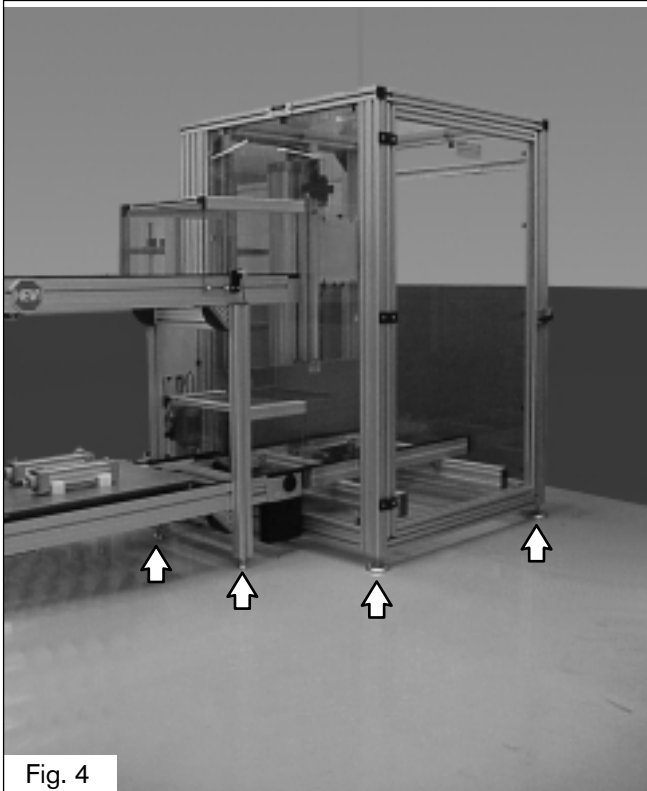
Although subsequent steps are pictured with the guards removed for ease in viewing, the guards must be installed before the VT2 is operated.

! WARNING! Guards must be attached before the VT2 is operated! Failure to attach guards may result in serious injury!



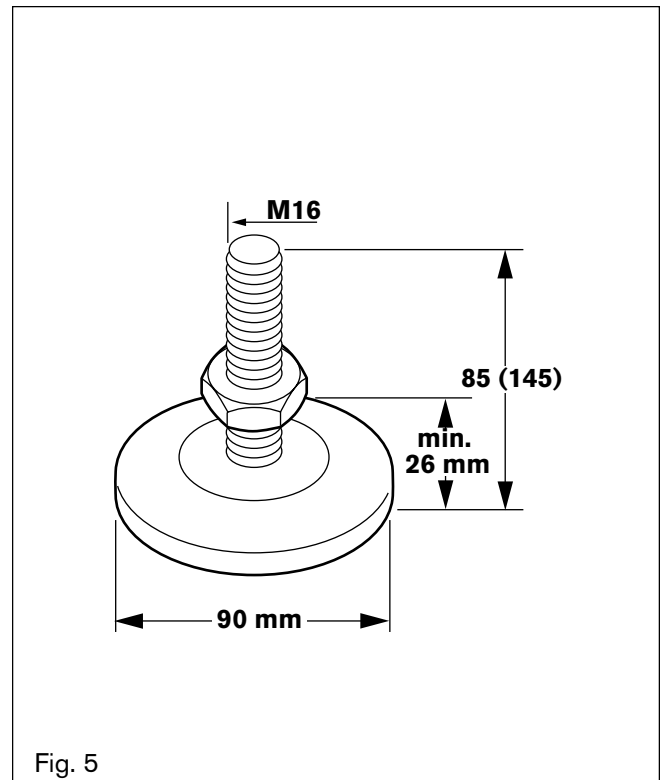
Alignment with the Transport System (Fig. 4)

1. Position the VT2 at the end of the conveyor section.
2. Make approximate height adjustments by adjusting the leveling feet (Fig. 4).



Leveling the VT2

1. With the carriage plate in its lowered position (Fig. 4), place a level on the transverse conveyor and level the VT2 by adjusting the leveling feet.
2. Lock the hex nuts on the leveling feet (Fig. 5).



Foundation Brackets and Anchor Set

When the VT2 has been leveled and aligned, it must be anchored in place using the foundation brackets and Anchor Bolts.

1. Mount the foundation brackets to the VT2 strut profiles using the T-bolts provided (Fig. 6).
2. Drill a 5/16" dia. hole (8 mm) for each foundation bracket in the floor.
3. Tighten the floor anchor bolts.

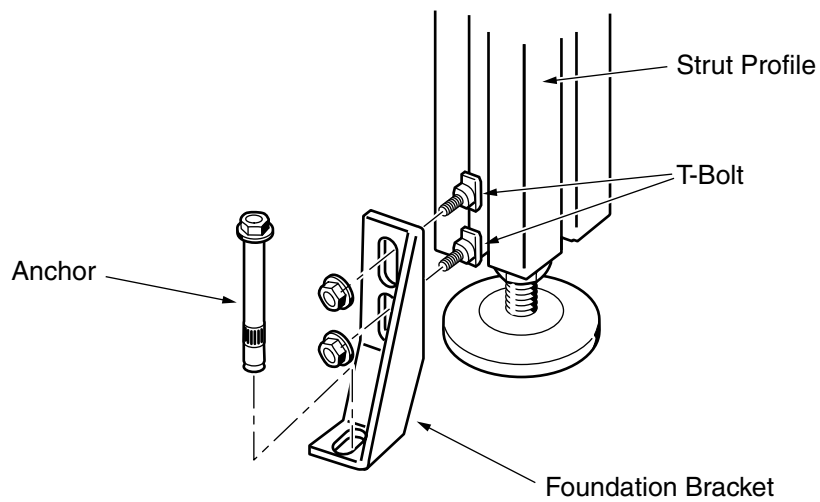


Fig. 6

Initial Start-Up

Plumbing the Pneumatic Cylinder

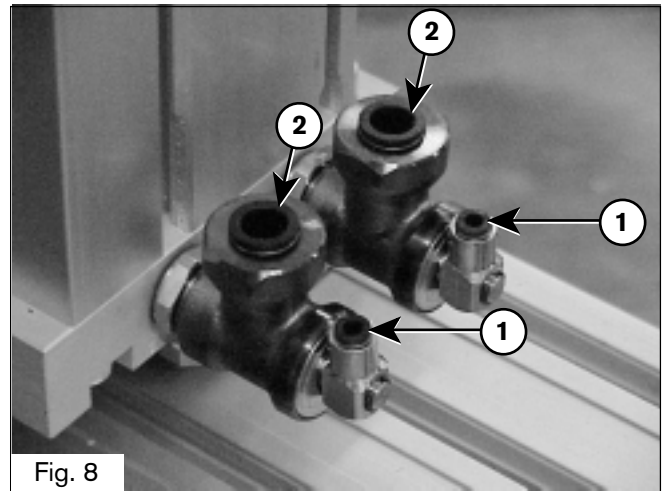
For air connections to the pneumatic cylinder, refer to (Fig. 7) facing page.

NOTE: Since the cylinder itself is stationary, it is not necessary to route the pneumatic cylinder tubing through the cable guard. Access holes for stationary air and electrical connections may be drilled in the polycarbonate panel on the rear of the VT2.

Plumbing Procedure:

1. Use 5/32" dia. (4 mm) tubing and connect the pilot air fitting on the lower check valve to the air supply. Again, the fittings are all pushlock type (Fig. 8).
2. Connect the main port of the check valve to the air supply using 3/8" (10 mm) plastic tubing.
3. Use the same procedure for the upper check valve air connections (Fig. 10).

NOTE: Filtered and regulated air must be supplied.



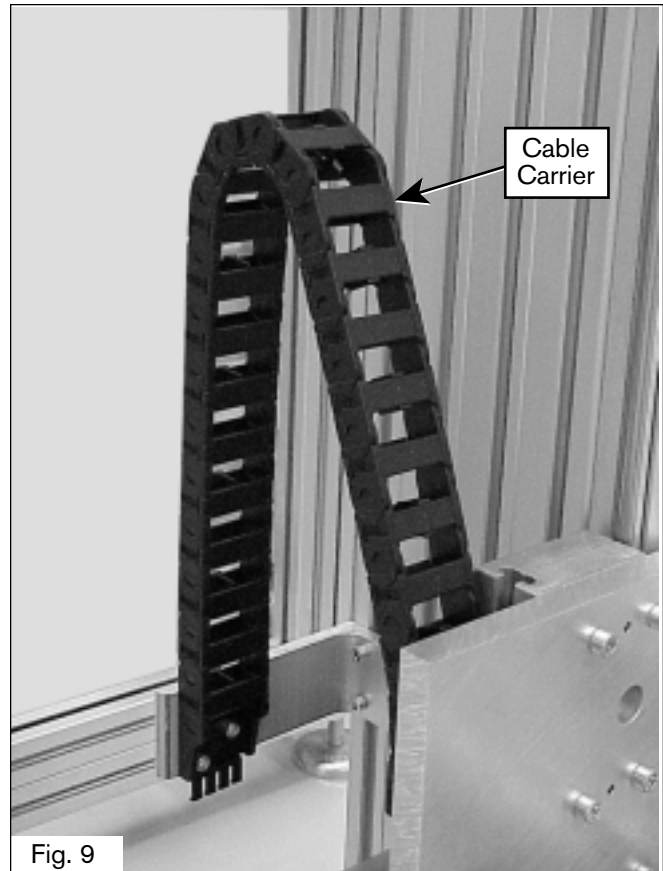
Plumbing the Stop Gate

NOTE: It is not necessary to plumb a VE2 stop gate if the VT2 is to be used in a reversing-type system. In this configuration, the stop gate functions as a hard stop only, i.e. pallets are not released to the other side. As a result, the pneumatic connection is not required. For through-type systems, however, the stop gate must be plumb.

1. Route 4 mm (5/32") diameter plastic tubing for the stop gate through the cable carrier.

NOTE: All plumbing on the carriage plate or transverse conveyor must be routed through the cable carrier to avoid damage.

2. Push one end of the plastic tube into the air supply fitting on the stop gate. Tug lightly on the tubing to make sure it is locked in the pushlock fitting.
3. Attach the other end to a filtered regulated air supply.



Transport Level Adjustments

IMPORTANT: Use extreme care when making transport level adjustments. Please read instructions carefully before beginning work and heed all warnings. Failure to heed warnings may result in serious injury

Gross Transport Level Adjustment, Lower Level

Refer to Figure 10.

1. First, pressurize the cylinder and raise the -carriage plate.
2. Next, loosen the four socket head cap screws on the lower shock mount.
3. Position the shock mount at the desired height by moving it in the T-slot on the supporting strut profile.
4. When the shock mount is positioned correctly, retighten the socket head cap screws to 25 Nm (18 lb-ft). Do not exceed a torque of 25 Nm for any threaded fitting in the aluminum strut profile.

Firm Transport Level Adjustment, Lower Level

1. For fine position adjustment, first lower the transverse conveyor so that the carriage plate is resting on the lower stop. Then loosen the locknut on the hard stop of the lower shock mount (Figure 10).
2. Then screw the fine adjustment screw in or out as necessary, and retighten the locknut.

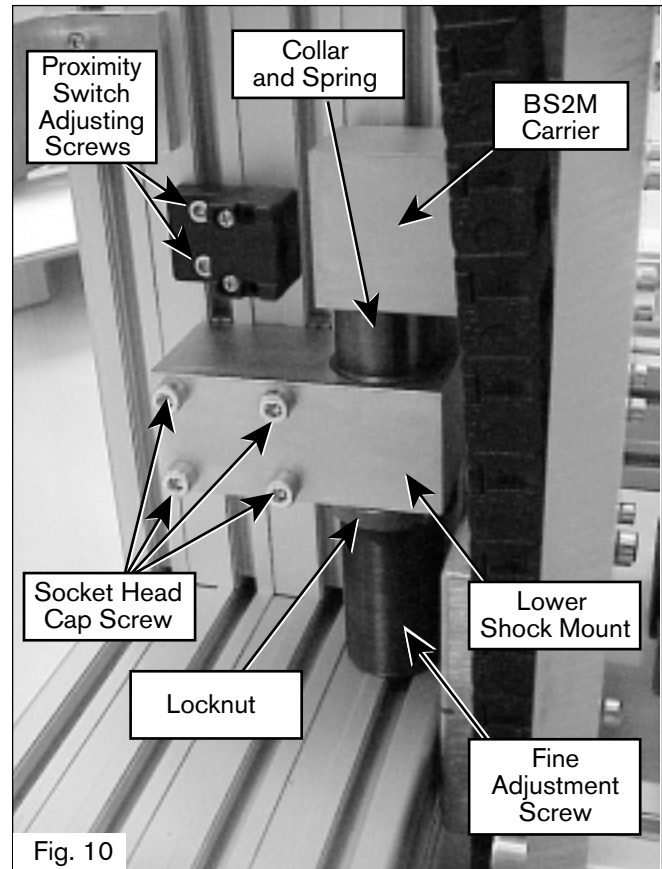


Fig. 10

⚠ CAUTION! PINCH POINT! Always support the carriage plate and transverse conveyor if they are in the raised position for transport level adjustments to the lower level. Failure to support the carriage plate may cause it to be lowered inadvertently and result in serious injury!

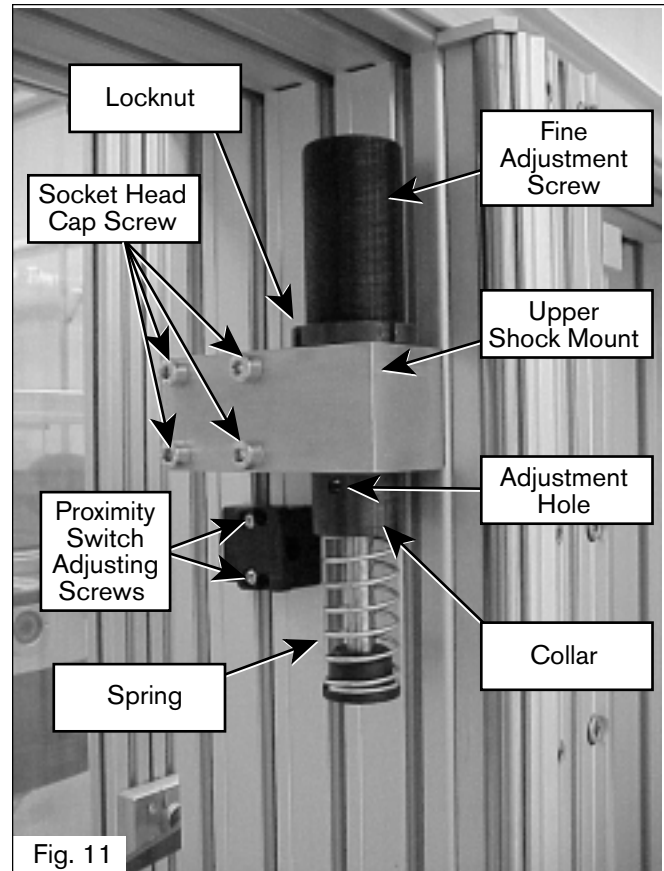
3. Finally, run a straight edge from the transverse conveyor to the in-feed main conveyor and place a level on it to ensure that the unit is level and aligned. Readjust the leveling feet as required

Gross Transport Level Adjustment Upper Level

Adjustments to the upper transport level are the same as those for the lower level.

1. First, make sure that the carriage plate is in the lowered position. If it is not, supply air to the cylinder and lower the transverse conveyor completely.
2. With the carriage plate in the lowered position, loosen the four socket head cap screws on the upper shock mount (Figure 11).
3. Now position the shock mount at the desired height by sliding it up or down in the T-slots on the supporting strut profile.
4. When the shock mount has been correctly positioned, retighten the socket head cap screws to 25 Nm (18 lb-ft.).

! CAUTION! DO NOT raise the carriage plate while the upper shock mount is loosened for adjustments!



Fine Transport Level Adjustment, Upper Level

⚠ CAUTION! PINCH POINT! Make sure that the carriage plate is raised completely before making fine adjustments to the upper transport level. Failure to raise the carriage plate may result in serious injury!

1. Make sure that the upper shock mount is firmly in place. Then raise the carriage plate by supplying air to the cylinder. The upper stop bolt on the carriage plate should rest squarely against the stop collar on the upper shock absorber, Fig 12.
2. To adjust , loosen the lock nut on the carriage pallet and screw the stop bolt in or out until the transverse conveyor transport level is exactly even with the upper transport level of the conveyor. Always use extreme caution when making any adjustment to the VT2 transport levels.
3. Check the level as before by placing a level on a straight edge that runs from the transverse conveyor to the in-feed main conveyor.
4. When the levels match exactly, retighten the lock-nut

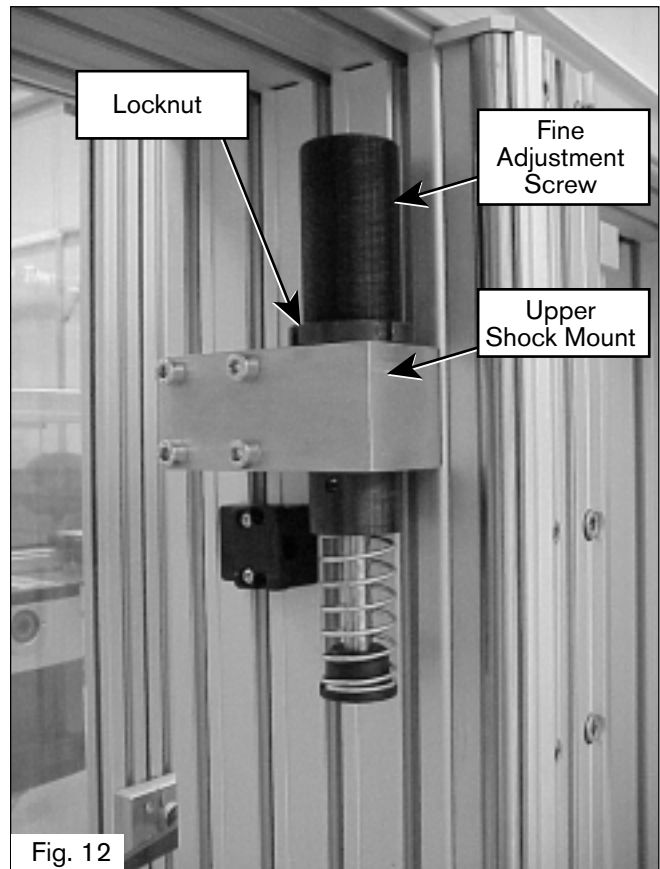


Fig. 12

Transverse Conveyor Motor Connections

IMPORTANT! All electrical wiring must be connected by a qualified electrician and in accordance with local electrical codes!

NOTE: The customer assumes all responsibility for the control system, and must provide an EMERGENCY-OFF SWITCH for the BS 2/M transverse conveyor.

Before starting up the conveyor for the first time, recheck all mounting hardware for tightness.

Locate the data tag on the motor and determine the wiring connection used (Y or Delta) by referring to the "Volts" information box on the data tag, then follow the appropriate connection schematic at left.

NOTE: The rotation marks in Figures 13 b and 13 c apply to the rotor shaft only. To reverse the direction of rotation, transpose any two leads.

To avoid damage to the power cables, make sure that the cables are long enough to reach the cable input on the terminal box (Figure 13 d) without stretching, and secured in such a way as to prevent them from interfering with other objects.

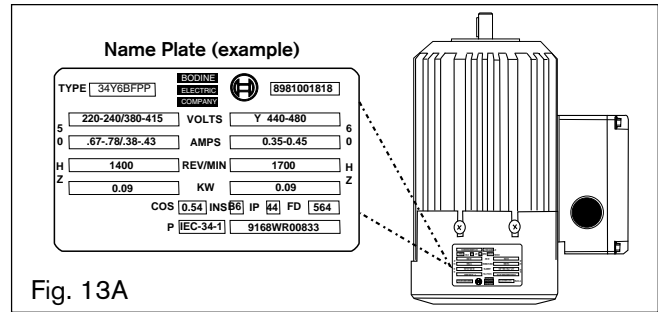


Fig. 13A

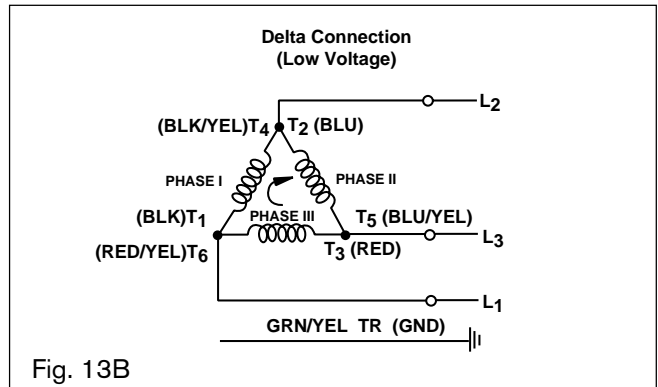


Fig. 13B

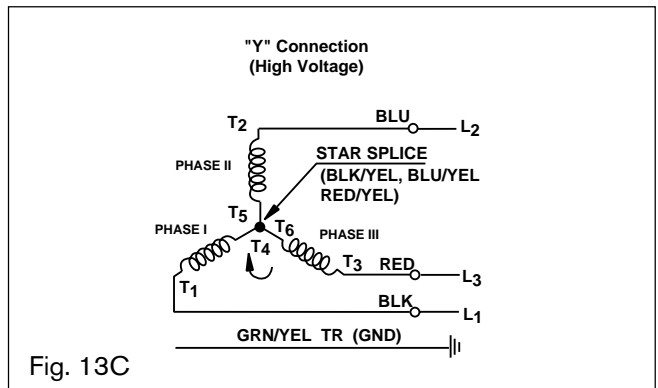


Fig. 13C

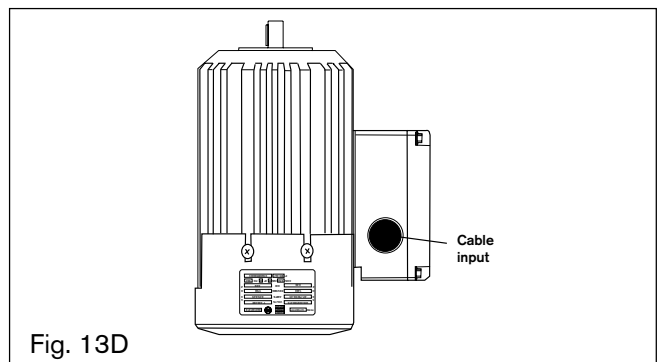


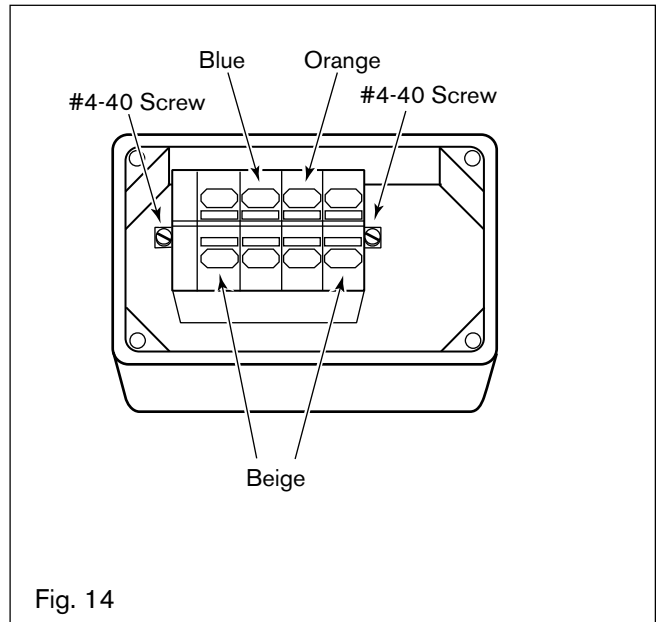
Fig. 13D

For CE Applications

If a CE compliant module was ordered, an optional terminal block (Fig. 14) was included. Refer to the terminal box mounting instructions included with the terminal box. If a copy of the CE declaration is required for your records, please contact our applications engineering department for the most current version.

Terminal Block Assembly Instructions

1. Attach the terminal box to the motor according to the mounting instructions included with the terminal box. See Fig. 14.
2. Assemble the terminal block components to produce an assembly having the following order: support block, beige middle, blue middle block, orange block and beige end block. See Fig. 14.
3. Secure the terminal block assembly to the terminal box using two #4-40 screws in the position shown. Tighten in the range 3 to 5 lb-in.
- 5 For a “DELTA” connection, terminate the motor and line leads as follows:
 - a Insert the red-yellow motor lead, the black motor lead and a line lead into the blue middle block.
 - b Insert the black-yellow motor lead, the blue motor lead and a line lead into the orange middle block.
 - c Insert the blue-yellow motor lead, the red motor lead and a line lead into the beige end block near the motor lead exit.



- Fig. 14
- 6 For a “Y” connection, terminate the motor and line leads as follows:
 - a Insert the black-yellow, and blue-yellow and red-yellow motor leads into the beige middle block opposite the motor lead exit.
 - b Insert the black motor lead and a line lead into the blue middle block.
 - c Insert the blue motor lead and a line lead into the orange middle block.
 - d Insert the red motor lead and a line lead into the beige end block near the motor lead exit.



Proximity Switches

For proximity switch and stop gate operation and installation refer to Bosch document # 8981 500 239.

1. Route the wiring for any proximity switch used on the transverse conveyor through the cable carrier as required.
2. Connect the wiring as required to a control system

Recommended Sequence of Operation (Inputs/Outputs)

The recommended inputs and outputs for a reversing type VT2 are shown in Table 2.

IMPORTANT! User-provided programmable logic controller or equivalent control logic must incorporate proper functioning of the safety door interlock! The user assumes all responsibility for safe operation of the VT2.

Sense Positions

1. Sense down position
2. Sense up position
3. Sense pallet in position
4. Sense pallet in position (For optional multiple pallet lifting operations)

A. For a Reversing-Type VT2:

INPUTS:

1. Carriage plate in upper position (normally open)
2. Carriage, plate in lower position
3. First pallet in VT2
4. Last pallet in VT2 (if used)
5. Door interlock switch (Customer Supplied)

OUTPUTS:

1. Carriage plate raise
2. Carriage plate lower
3. Transverse conveyor motor run forward
4. Transverse conveyor motor run reverse

Recommended Operating Sequence:

LOADING

1. Carriage plate in load position
2. Transverse conveyor run to load/lower prestop on feeding conveyor
3. Wait until last pallet in
4. Raise prestop on feeding conveyor
5. Transfer carriage plate to unload position
6. Transverse conveyor run to unload
7. Wait until last pallet clear (sensor located on adjacent conveyor)
8. Transfer carriage plate to load position
9. Reset cushion stop on BS2M (if supplied).

CYCLE COMPLETE

B. For a Pass-Through VTPU

- Remove one (1) output #4 above reversing transverse conveyor.
- Add one (1) output for stop gate in VT2.

Table 2: Recommended Sequence of Operation

Positioning the Stop Gate

Although the stop gate comes pre-mounted on the transverse conveyor, additional adjustment may be necessary for exact positioning.

1. Place the desired number of pallets on the transverse conveyor. Do not exceed load restrictions, however. The maximum number will depend on:
 - a. pallet size
 - b. pallet loading
 - c. cycle time
 - d. system configuration

2. Position the stop gate (Fig. 15A). The stop gate must be placed on the drive end of the transverse conveyor so that the pallet is not transported over its edge.

3. Attach the stop gate to the transverse conveyor using the T-bolts as shown in (Fig. 15A).

4. If using the VPTU with a pass-through system (Fig. 15B), plumb the stop gate using 5/32" diameter plastic tubing.

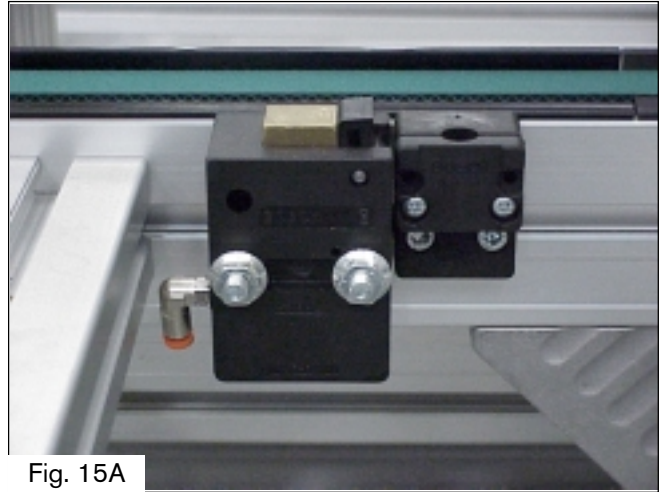


Fig. 15A

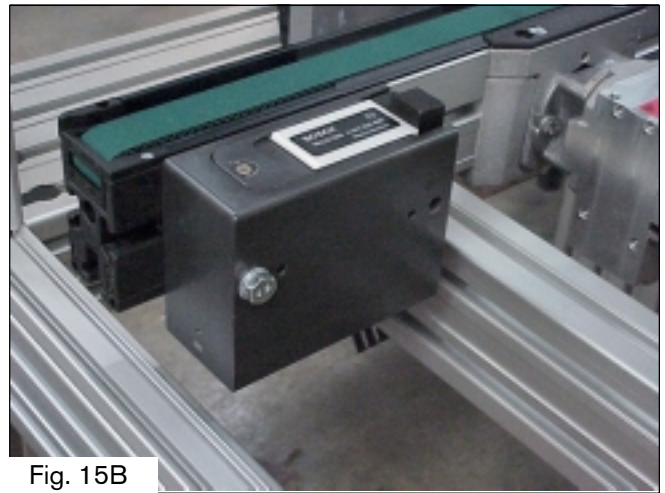


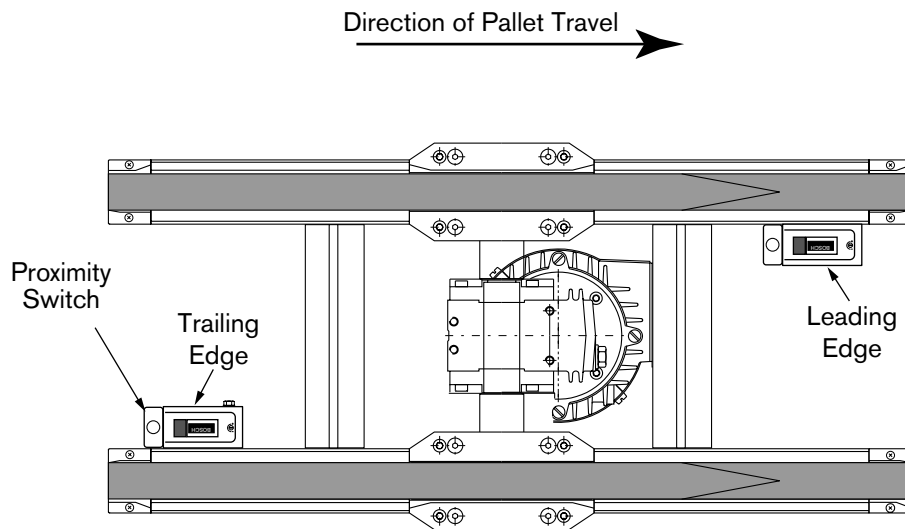
Fig. 15B

IMPORTANT! The stop gate pneumatic tubing must be routed through the cable carrier.

Positioning the “Last Pallet” Proximity Switch

NOTE: The “Last Pallet” Proximity Switch is only necessary for multiple pallet operation. If a single pallet is used, its position is sensed by the proximity switch on the stop gate.

1. Place the desired number of pallets on the transverse conveyor.
2. Position the proximity switch on the transverse conveyor so that it will sense the exciter plate on the last pallet. To position the switch, loosen the socket head cap screws (Fig. 16) on the proximity switch mounting bracket. Move it in the transverse conveyor T-slot to the desired location and re-tighten the screws.
3. Adjust the proximity switch so that the gap between the switch end face and the exciter plate is less than 2 mm. To adjust, loosen the phillips head screws on the proximity switch housing and move the switch up or down as necessary. Retighten the screws when adjustment is completed.
4. Route the proximity switch wiring through the cable carrier and connect it to the control unit.



Stop Gate Positioning

Fig. 16

Guards and Safety

⚠ WARNING! Do not operate the unit without installing all guards! Failure to do so may result in serious personal injury! It is the responsibility of the end user to insure safe operation and to install adequate point-of-operation guarding.

Before starting up the VPTU, make sure that all guarding elements are properly installed (Fig 17). This entails cutting openings in the VT2 side panels for:

1. Pallet entry and exit
and
2. Install conveyor line guarding (tunnel guards)

Procedures for installing both types of guards are described in the following sections.

Additionally, access holes must be drilled in the rear panel for stationary air and power lines.

Return the unit's safety door to its closed position and ensure during initial operation that the door safety interlock is functioning properly.

Cutting Openings for Pallet Entry and Exit.

The VT2 is delivered with the safety door, top and back panels already attached. If pallets will enter and exit the VT2 on the same side, openings in only one panel will need to be cut. If pallets will enter and exit on opposite sides, openings will need to be cut in both side panels.

Detaching the Polycarbonate Panel(s):

Side panels are held in place with a rubber gasket pressed into the T-slot on the four corner profiles.

Gently peel up the gasket starting at one corner of a profile and pull the entire gasket from the profile. See (Fig. 18).

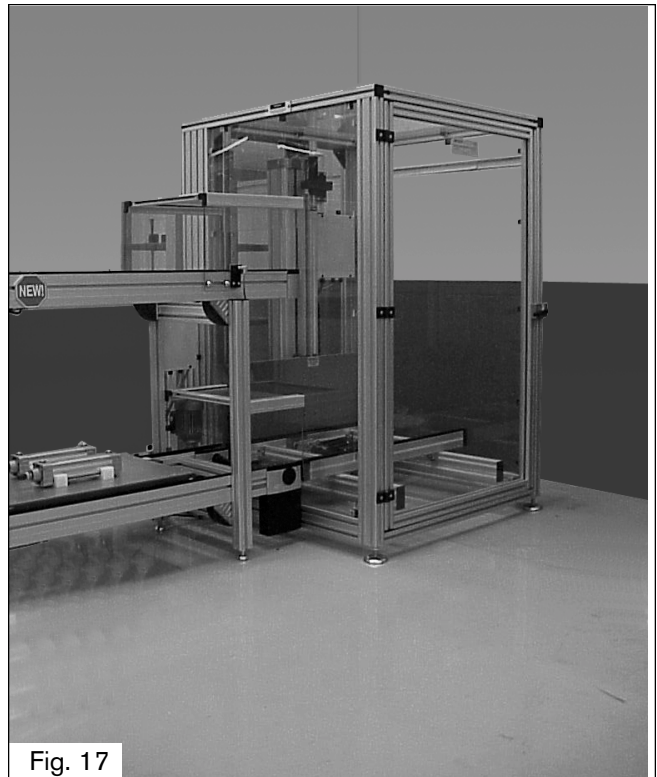


Fig. 17

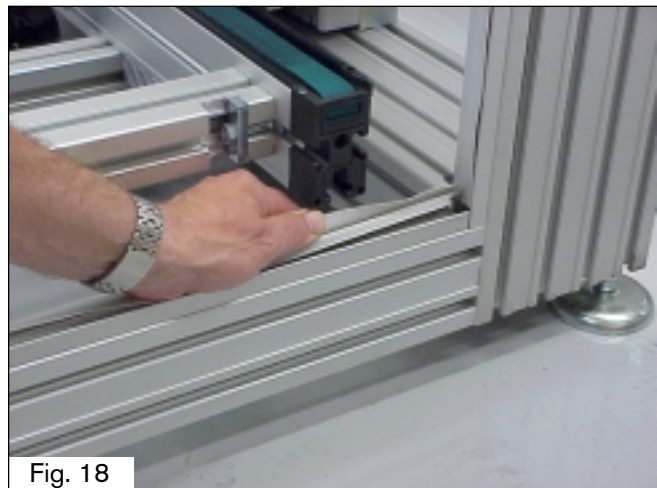


Fig. 18

Cutting the Openings

Cut opening in the side panel (or panels) at the points where pallets will enter and exit the VT2. Locations will vary, depending on the application.

1. Using a straight edge and pen, draw the cut pattern(s) on the wrapper of the panel where you need the opening(s). Fig. 19 shows an example for cut patterns for a VT2 used in over and under operation.

The width of the opening will be equal to the pallet width BWT + 30 mm. Determine the height of the opening based on the height of the tallest workpiece which must pass into and out of the VT2.

NOTE: The opening for the lower conveyor line (if you are using the VT2 for over and under operation) is limited to a maximum height of 233 mm.

2. Drill a hole in each corner of the square pattern large enough to insert a jigsaw blade (i.e. 1/4" or larger if using a 1/4" jigsaw blade).

NOTE: These holes facilitate cutting only. They are not to be confused with the holes shown in Fig. 19. The holes shown in Fig. 19 must be drilled to secure the tunnel guards to the VT2.

3. Cut the opening in the panel with a jigsaw, then smooth the edges with a deburring knife or file. If desired, clean the clear polycarbonate panel with one of the cleaners recommended on the wrapper.
4. Drill holes in the panel for fastening the conveyor line tunnel guards to the VT2.
5. Reattach the side panels making sure the openings line up with the VT2 transverse conveyor using the rubber gaskets previously removed.

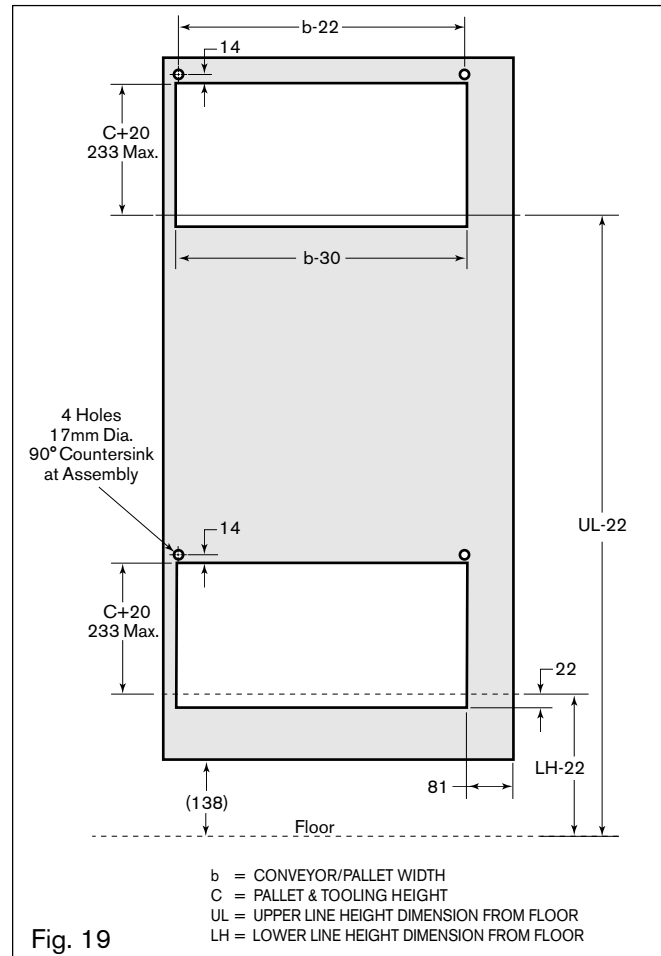


Fig. 19

Conveyor Line Tunnel Guards

IMPORTANT! Attach all side panels and tunnel guards before operating the VT2.

An additional set of guards and mounting fixtures are included and must be attached to the conveyor line at the junction with the VT2 before start-up. The following steps are common to both types of guarding.

1. Check the tunnel guard height with respect to the openings in the VT2 and if necessary cut to the proper size.

2. Drill holes in the VT2 side panels for attaching the tunnel guards.
3. Attach the tunnel guards to the conveyor line and VT2.

NOTE: DO NOT CUT THE TUNNEL GUARDS TOO SHORT! The tunnel guards must mount to the VT2 at least 14 mm above the top edge of both the upper and lower VT2 openings (Fig. 20).

1. Assemble the tunnel guards and mount them to the line using the fasteners provided. For over and under operations, the upper tunnel guard is fastened to the conveyor section using T-bolts. The Lower Tunnel guard rests on the drive or return module housing and is held in place with small aluminum gussets.

2. Check the height of the tunnel guards relative to the VT2 openings. Too much clearance may not prevent operators from reaching inside the tunnel guards. If you need to lower the side guards, make any cut line directly on the die guards while still mounted on the conveyor. This will help you to avoid cutting the guards too short. Remember the tunnel guard strut profiles must be fastened to the VT2 at least 14 mm above the side panel openings.
3. If necessary, remove the tunnel guards from the line and cut them to size. Then replace them, using the mounting hardware provided.
4. Drill holes in the VT2 side panels for fastening the tunnel guards to the VT2. When the holes are drilled, countersink for the flat head screws provided, then use the flat head screws to fasten the tunnel guards in place.

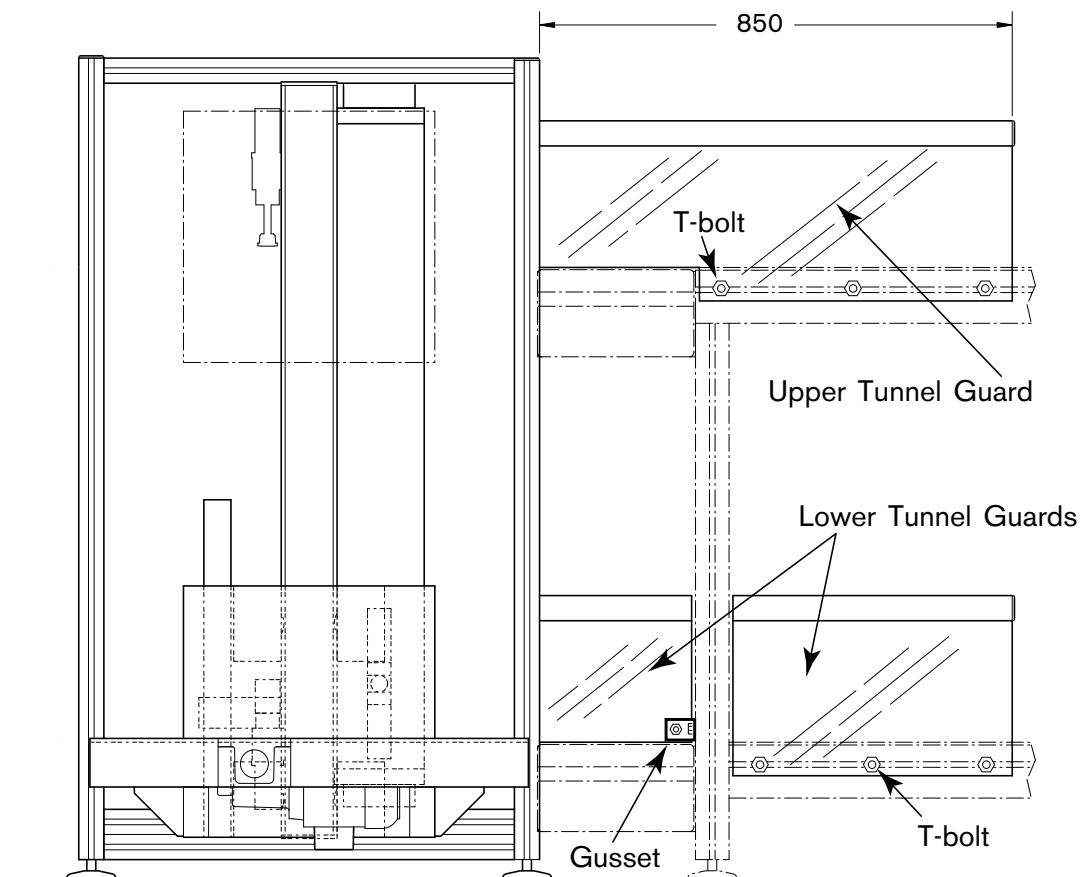


Fig. 20

Operating Instructions

The VT2 is part of the TS*plus* conveyor which is designed to transport Bosch WT2 workpiece pallets or WT2 workpiece pallet frames with integrated fixtures built into the pallet design. Since the conveyor is modular in design and part of a larger operating

assembly system, it is the responsibility of the integrator or end user to provide a control system and operating procedures. For your safety, please observe the following guidelines when operating the conveyor and vertical transfer unit.

⚠ WARNING!

- Use a qualified technician who is familiar with the control system during the initial start-up.
- In case of control system failure, **DO NOT** attempt to catch or in any way prevent a pallet from falling from the end of the conveyor. Use the emergency stop switch to halt conveyor movement!
- **KEEP HANDS CLEAR** of moving conveyors and pallets. Pallet accumulation creates a crush hazard between pallets, stop gates, and guide rails. A crush and pinch hazard exists between Lift Position Units, Lift Transfer Units, Lift Rotate Units, and Vertical Transfer Units. Assembly operations should be performed **ONLY** when the workpiece pallet has come to a complete stop.
- **DO NOT** perform pressing operations on a workpiece pallet without the use of a Lift Position Unit.
- **DO NOT** operate the conveyor, vertical transfer unit or any other components in the system with the guards removed. It is the operator's responsibility to make sure that all guards, covers, and other safety equipment is in place before the system is put into operation.

⚠ CAUTION!

- Do not operate or work near mechanical equipment when wearing loose clothing. Moving components such as roller chain, drive belts, drive shafts and pallets can snag long belts, scarves, ties and other loose fitting garments, pull the worker into the equipment and cause serious, or in extreme cases, life threatening injury.
- Operators having long hair must wear appropriate head protection (hair nets, hats, and hair caps) to minimize the risk associated with working near moving machinery. Hanging hair can get caught in moving components such as roller chain, drive belts, drive shafts and pallets, pull the worker into the equipment and cause serious, or in extreme cases, life threatening injury.

Safety Door Interlock (Switch Not Supplied)

NOTE: The Door Safety Interlock is designed to mechanically lock the door when the VT2 is in operation!

To check the door safety interlock, bring the VT2 into operation. After it has begun operating open the door. The safety interlock is functioning properly if the unit ceases to operate when the door is opened.

If the VT2 continues to operate when the door has been opened, shut the unit off and check the wiring to make sure that the door interlock proximity switch wiring is still connected to the control unit. When the necessary adjustments have been made, resume operation and check the door interlock again.



Fig. 19

Vertical Pallet Maintenance

! CAUTION! Turn off all power and air supplies before beginning maintenance work of any type!

NOTE: For transverse conveyor maintenance, refer to the operating and assembly instruction manual BS2/M 8981 500 277.

The Vertical Pallet Transfer Unit has been designed to operate with very little maintenance. The simple maintenance routine that follows will ensure continuous smooth operation.

Perform the steps below at regular intervals:

1. Check the shock absorbers for oil leaks. Inspect both the upper and lower shock absorbers for oil leaks and replace as necessary.
2. Check for leaks in the air supply. Inspect all hoses and fittings for air leaks and replace if needed. Check the VT2 for smooth operation.

Observe the unit to make sure that it is operating smoothly. If the raising and lowering action is impaired, check the air pressure regulator to make sure that the air supply is smooth and consistent, and make any necessary adjustments.

REPAIR

The transverse conveyor may require the replacement of some parts, such as belts. The replacement procedures for transverse conveyor components are as follows.

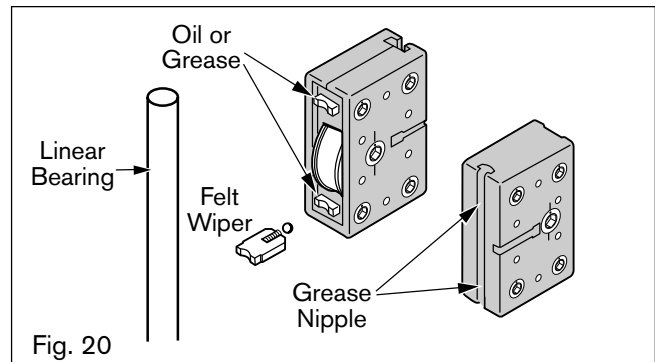
Vertical Pallet Linear Bearings Maintenance

Lubricate the vertical pallet linear bearings every 6 months or 10,000 km (Fig. 20).

Under heavy loads or extreme conditions, (temperature, humidity, or dusty conditions) lubricate every 3 months or 5,000 km.

Replace support bearing if any wear is present on either the roller or roller bearing (operating noise, play in the roller bearing, fluctuating or altered test force F, rust due to abrasion).

Soak the felt wipers on the support bearings with oil or grease them. If grease is used, press in also at the grease nipples until it emerges around the felt. Lubricate the shaft with:



High-performance Oil:

$\nu/40^{\circ}\text{C} = 200 \text{ mm}^2/\text{s}$

Aral Deganit B220

Grease:

Kluber Isoflex Topas NCA 52

Shell Alvania RS (US: Alvania 2)

Adjust each linear bearing for minimum play (Test force F) (See Fig. 21).

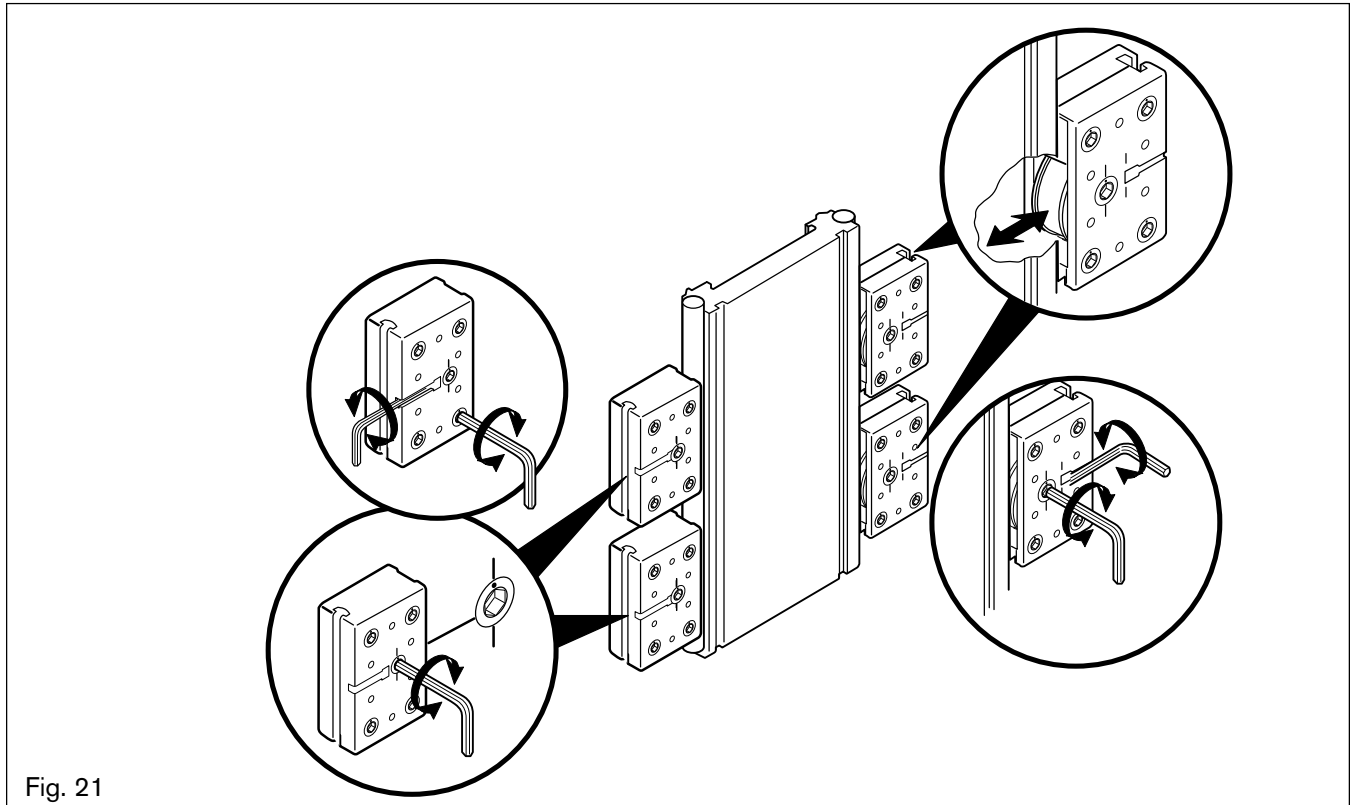


Fig. 21

Transverse Conveyor Maintenance

⚠ WARNING! LOCK OUT all power supplies and release pressure from compressed air lines before beginning maintenance work of any type.

The following cleaning and adjustment procedures will help keep your conveyor in optimal condition if performed on a regular basis. See (Fig. 22).

1. The sealed gearbox is maintenance free. It should, however, be inspected regularly for damage or oil leakage caused by excessive wear.
2. To ensure that the motor remains cool enough, remove all dirt and dust from the motor surface, intake opening, fan hood, and between the cooling fins at least once per week.

3. Check the toothed belt for wear and damage, especially at the arrow shaped weld joint. Wipe the conveyor clean of any excess grease, dirt, and any foreign substances regularly. Replace any parts showing signs of excess wear.
4. Verify that the idle rollers rotate freely and are not damaged. Stuck or damaged rollers will lead to premature belt failure.

Regularly check that all connectors and fasteners are properly tightened and retighten to their proper torque as needed.

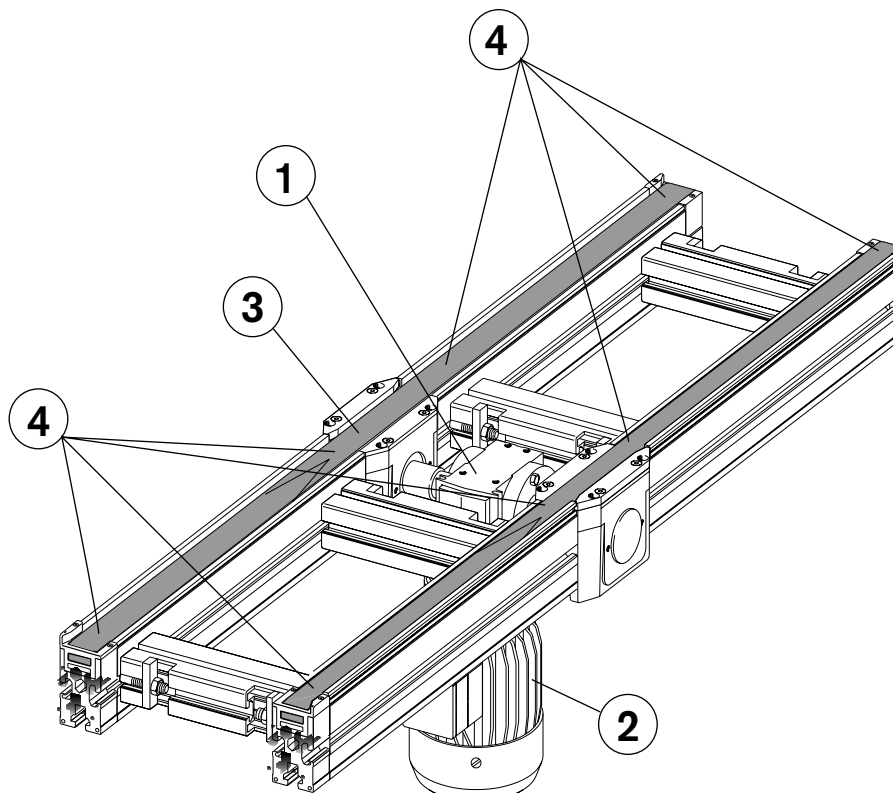


Fig. 22

Repair Procedures

Replacing the toothed belt (Fig. 23)

NOTE: Before removing the old toothed belt, verify that the replacement belt is of the proper length (L). An improperly sized belt will cause poor performance and may cause damage to the conveyor system.

CAUTION! Lock out all power supplies before beginning repair work of any type!

Refer to Fig. 23 for the following steps.

1. Carefully remove the snap-in belt guide profile from the aluminum profile by pulling up on the outside edge. It may be necessary to pry it out by carefully inserting a screwdriver between the guide profile and the aluminum profile and gently prying out the guide profile.
 2. Loosen the four M5 x 30 socket head cap screws on each side of the two bearing housing assemblies.
 3. Loosen the two flat head phillips screws on top of the two return assemblies and remove retainer.
 4. Carefully lift up the belt and return rollers.
 5. Slide the return roller out of the belt.
-

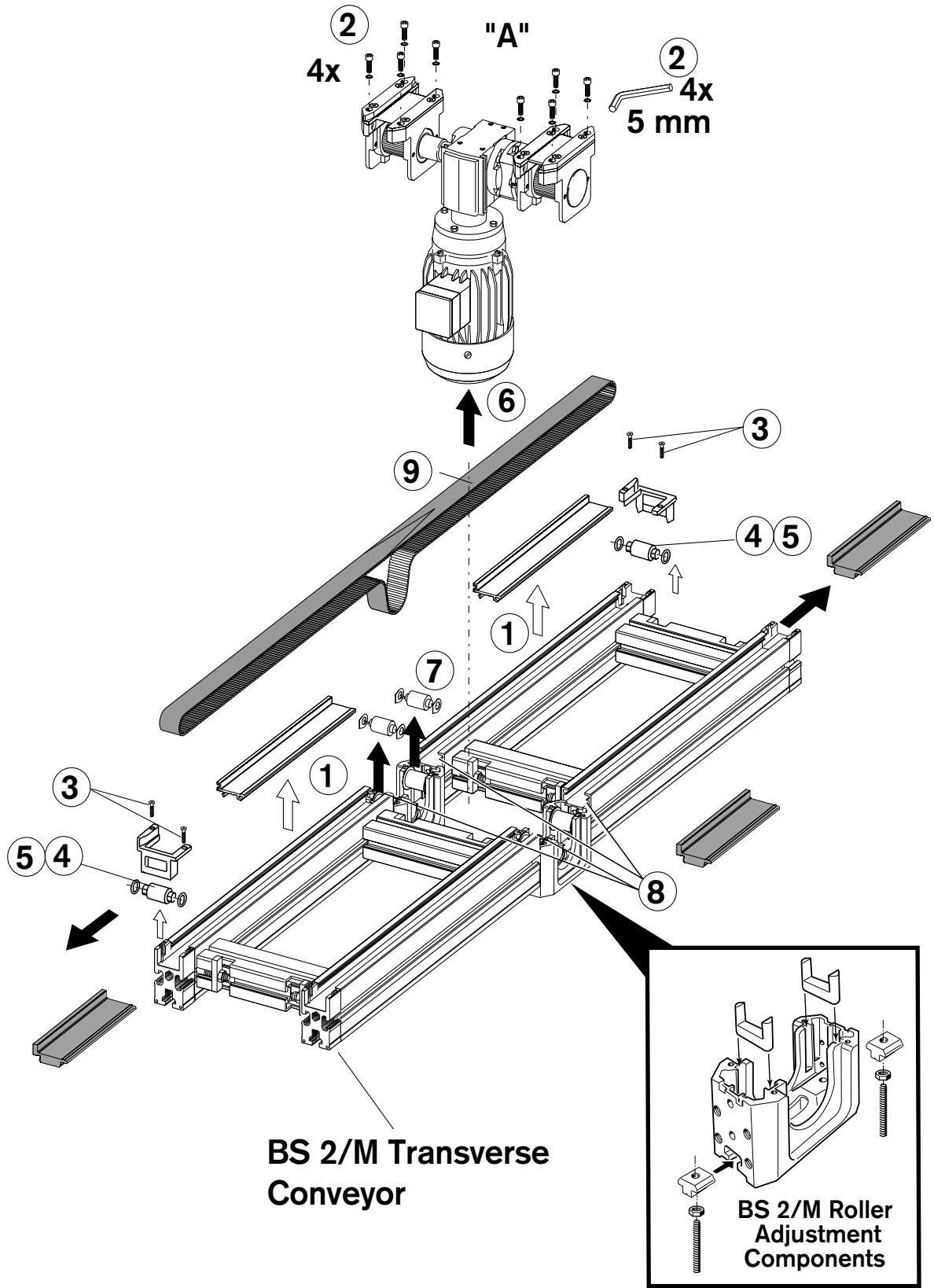
CAUTION! If the drive unit is not kept level during removal and installation, it may cause damage to the unit by bending or twisting the components. Also, the two sides may separate and fall, potentially damaging the unit and causing personal injury!

6. Carefully lift the upper bearing housings with the motor and gearbox and remove. Use caution handling these parts because they are NOT mechanically fastened together!
7. Remove the two idler rollers adjacent to the aluminum profile on both sides of the bearing housing.
8. Slide the belt end guides out of the aluminum profile and remove.
9. Lift out the old toothed belt.

Installing the new belt:

To install the new belt, reverse the steps above, making sure to:

1. Verify that the new toothed belt is properly lubricated. Oil the toothed surface of the belt with a high quality spindle oil, if necessary.
2. Make sure that the pointed end of the arrow shaped weld is pointing in the direction of forward movement, i.e. towards the drive unit.
3. Make sure that the 8 idler rollers are free of dirt and damage, and spin freely.
4. Carefully lower the drive assembly into place, keeping it level. Secure with socket head cap screws, alternating between sides and diagonally opposite corners on the assembly.
5. Rotate the roller adjustment setscrews (shown in the inset in Fig.23) to properly tension the new toothed belt. When the belt is properly tensioned, tighten the locking nuts on the setscrews to maintain adjustment.



BS 2/M Transverse Conveyor

BS 2/M Roller Adjustment Components

Fig. 23 Replacing the Toothed Belt



Module Warranty

BOSCH AUTOMATION PRODUCTS warrants to the original purchaser the modules manufactured by us to be free from defects in materials and workmanship under normal use and service. Our obligation under this warranty shall be limited to the repair or exchange of any part or parts which may thus prove defective under normal use and service within one (1) year from date of installation by the original purchaser. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE, AND WE NEITHER MAKE NOR AUTHORIZE ANY OTHER PERSON TO MAKE FOR US, ANY WARRANTY IN CONNECTION WITH THE SALE.

This warranty shall not apply to the modules or any part thereof that has been subject to accident, negligence, alteration, disassembly, abuse, or misuse after delivery by us. The term "Original Purchaser", as used in this warranty, shall be deemed to mean the customer to whom the modules were originally sold.

Our obligation under this warranty is limited to the modules only, and excludes wear items, such as belts, etc., and we may not be responsible for system concept, design, engineering, or function beyond this.

For further information, contact:

BOSCH AUTOMATION PRODUCTS

816 East Third Street
Buchanan, MI 49107
Tel: 269-695-0151
Fax: 269-695-5363

Liability:

In no event can the manufacturer accept warranty claims or liability claims for damages resulting from improper use of the equipment or as a result of changes made to the equipment other than those specified in this instruction manual.

The manufacturer will accept no claims in which non-original spare parts have been used. For information on spare parts and replacement parts, refer to publication no. 8981 500 281 *TSplus* Spare Parts List or 8981 500 170 TS2 and TS2/C Spare Parts List.

Environmental Protection:

Always dispose of worn, damaged or obsolete parts in a responsible manner. Some components, such as gearboxes, contain lubricating oil which can pollute the environment. It is the user's responsibility to dispose of all hazardous material within the components following all local, state and federal guidelines.

Please contact Bosch for copies of the Material Safety Data Sheets (MSDS) for the lubricating oil used in gearboxes.

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